

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
18 October 2001 (18.10.2001)

PCT

(10) International Publication Number  
**WO 01/76384 A1**

- (51) International Patent Classification<sup>7</sup>: **A23G 3/30** (74) Agent: **ANKARA PATENT BUREAU LTD.**; Sehiti Adem Yavuz Sokak 8/22, Kizilay, 06440 Ankara (TR).
- (21) International Application Number: **PCT/TR00/00019** (81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: **12 April 2000 (12.04.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (71) Applicant (*for all designated States except US*): **DANDY SAKIZ VE ŞEKERLEME SANAYİ A.Ş.** [TR/TR]; Mahmutbey Mah. Taşocacı Yolu caddesi No. 15, Bağcılar, 34550 İstanbul (TR).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **NIELSEN, Hans, Erik** [DK/DK]; Sogneskillet 24, DK-8732 Hovedgaard (DK). **ACAR, Nesim** [TR/TR]; Dandy Sakiz ve Şekerleme Sanayi A.Ş., Mahmutbey Mah. Taşocacı Yolu Cad. No. 15, Bağcılar, 34550 İstanbul (TR). **LEVI, Albert** [TR/TR]; Dandy sakiz ve Şekerleme Sanayi A.Ş., Mahmutbey Mah. Taşocacı cad. No. 15, Bağcılar, 34550 İstanbul (TR).
- Published:  
— with international search report  
— with amended claims
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: **AERATED NON-CARIOGENIC LOW-CALORIE SUGARLESS CHEWING GUM WITH LOW DENSITY AND IMPROVED PLAQUE REDUCTION PROPERTIES**

(57) Abstract: The present invention is related to an aerated sugarless gum product with improved plaque reduction properties. The gum is non-cariogenic low-kilocalorie with low density and has a gum base content above 90 %. The product is aerated to improve flexibility and softness. Preferred density is between 0,50 gram/millilitre to 0,90 gram/millilitre. The product has good elastic chewign properties and good bubble forming properties.

WO 01/76384 A1

**AERATED NON-CARIOGENIC LOW-CALORIE SUGARLESS CHEWING  
GUM WITH LOW DENSITY AND IMPROVED PLAQUE REDUCTION  
PROPERTIES**

5           The present invention is related to an aerated sugarless gum product with improved plaque reduction properties. The gum is non-cariogenic low-calorie with low density and has a gum base content above 90%. The product is aerated to improve flexibility and softness. Preferred density is between 0,50 gram/millilitre to 0,90 gram/millilitre. The product has good elastic chewing properties and good  
10 bubble forming properties.

          The present invention describes a gum product that has excellent tooth cleaning property. The gum is added carbonates and bicarbonates selected from sodium carbonate, sodium bicarbonate, potassium carbonate, and potassium  
15 ° bicarbonate or mixtures hereof to improve oral hygiene by neutralising the acid created from bacterial degradation of remaining food particles in the mouth after eating or drinking. Besides, carbonate or bicarbonate or mixtures thereof reduces the risk of carries significantly by keeping the pH above 5.5 in the mouth.

20           The mixture of carbonates and bicarbonates in the present invention shows quick remineralisation of the saliva and thus pH raises above 7,5 to prevent the formation of plaque. The carbonic acid created from the reaction between the carbonate and bicarbonate and the water in the human saliva is known as a good calcium remover. This is important as calcium from the food would then later have  
25 formed plaque on teeth.

The flavored gum can be added an intensive sweetener to improve the flavor perception. This makes the product more satisfactory for the consumers because of higher flavor perception and long lasting flavor.

5        The final product has a pure white color with kilocalorie content below 1 kilocalorie per piece. The product has no laxative effect as it lacks bulk sweeteners like sorbitol or xylitol.

### **Background of the invention**

10

As it is known, saliva acts as a natural defence mechanism in the mouth in order to maintain good oral hygiene. The saliva flushes the plaque on the teeth and helps to neutralise the acid and wash away sugars. This effect is enhanced if saliva flow after sugary snacks is stimulated – with fruit, vegetables, and cheese for example  
15 or with a gum as according to this invention, which has the advantage of prolonging the chewing. At the earliest stages of the decay process, the tooth surface may “heal” by deposition of essential minerals from the saliva. Saliva also helps to wash away the remaining food trapped in the hard-to-reach areas of the mouth.

20        While chewing the gum, chewing stimulates the production of saliva by up to several times its normal rate. When saliva flow is stimulated, its composition changes, the composition of bicarbonate increases, enhancing its ability to neutralise plaque acid. Also as saliva flow increases, the availability of minerals is increased to repair the early tooth decay.

25

The present invention describes a gum product that is added a mixture of carbonates and bicarbonates or mixtures hereof, to improve oral hygiene by

neutralising the acid created from bacterial degradation of food residue particles in the mouth. Besides, by keeping the pH above 5.5, the risk of carries is also reduced significantly as the acids created in the mouth by bacterial break down is neutralised very fast.

5

The mixture of carbonates and bicarbonates in the present invention shows good support to a quick demineralisation of the saliva and pH raises quickly during chewing to above 7,5 to prevent the formation of plaque. The carbonic acid created from the reaction between the carbonate and bicarbonate and the water in the human saliva is known as a good calcium remover. This is important due to the calcium from the food would then later have formed plaque on the teeth.

The carbonate and bicarbonate or mixtures hereof in the present invention show good support to the naturally produced bicarbonate in the saliva. First of all, because of the surplus of bicarbonate is released over an extended period of time and also as the carbonate brings pH in the mouth above 7,5, acids created from the food are neutralised immediately. Therefore, acid does not cause carries.

A clinical study has been carried out with 80 persons where the Quinley-hein plaque index (QHPI) has been measured over a period of 6 weeks with intermediate results after 3 weeks. The persons were split in 1 placebo group of 40 persons and a test group of 40 persons.

The placebo group the participants were brushing their teeth for 1 minute a day.

The test group the participants were brushing their teeth for 1 minute a day and they were chewing 3 gums a day after the meals.

Collected data was subsequently summarised by subject wise averages and analysed in the statistic software SAS.

Comparisons among the treatment groups were made using analyses of co-variance (ANCOVA's) in which the baseline scores were employed as co-variable. A level of significance of  $\alpha = 0,05$  was employed in all statistical tests of hypotheses.

- 5     The study showed for the whole mouth QHPI score after 3 weeks was 15,8% lower plaque index and after 6 weeks 24,9% lower QHPI plaque index.

The study show that the gum of the present invention will have an improved effect on the oral hygiene due to reduced formation of plaque and especially when chewed after  
10    food intake. The gum in the present invention will not create any laxative effect due to the lack of bulk sweeteners like sorbitol or xylitol.

#### **Prior art**

15            The present invention relates to a specific type of gum especially preferred in Turkey, in Middle East countries and former Soviet Union countries. The gum product consists primarily of gum base and flavour without any sweeteners or softeners and is aerated to improve flexibility and softness.

20            This is a traditional product in this region of the world. Earlier, people were used to chew a resinous substance called gum mastic that is collected from a special pistachio tree. This has been chewed for centuries to keep the mouth moisturised with saliva when people were working in the fields. This tradition has continued until today and people in general like to chew this type of gum.

25

The local gum industry has developed products in which the gum is based on a gum base containing only synthetic ingredients including styrene butadiene rubber.

This is added very low content of flavour and aerated to create the final gum. In the local market this type of product is called "oriental gum".

5 The flavours used in this type of product is flavours like gum mastic, rose, clover and similar flavours. Today, there are also more widely known flavours introduced like fruit and mint flavors but the traditional flavours are still widely preferred.

10 The state of the art of this gum is normally prepared with a mixture of gum base and a low content of flavor. The flavor is added to the gum base when the gum base is in molten stage to ensure good distribution of the flavor in the gum base.

15 The gum base is normally based on SBR rubber as polymer because it shows better pulling properties when being aerated on a pulling machine than other synthetic elastomers like polyisobutylene or butyl rubber do. Then, the gum base flavor mixture is cooled either directly in water and hereafter applied at the pulling machine where the gum is aerated by pulling.

20 The other production method known is the one described in WO 98/34497. Even in this process the SBR rubber gum base is unique due to its capability to entrap the air bubbles inside the gum base. In this process, gum base is cooled in a heat exchanger before flavor is added. Later the gum base and flavor mixture are mixed with air under pressure and by a relative low temperature environment in the range of 45°C to 65°C.

25

In both processes, after aerating stage, almost white gum is extruded to a gum rope and cooled in a cooling tunnel. It is then wrapped in a cut and wrap machine.

The products that is available and known on the chewing gum market today contain certain bicarbonates like sodium bicarbonate with a typical so-called salty taste and can easily be recognised by sensory evaluation by persons skilled in the art.

5 The products that are being marketed today always contain a mixture of bulk sweetener like mixtures of sugars or polyols like sorbitol or xylitol.

**Brief description of the invention.**

10 The present invention describes an aerated sugarless gum with improved oral hygiene properties that is low-calorie, non-cariogenic, low-density with a gum base content above 90% gum base. The gum is aerated with a preferred density between 0,5 gram/millilitre to 0,90 gram/millilitre to improve flexibility and softness. The gum in accordance with the present invention has been added active ingredients such

15 as at least one carbonate and one bicarbonate and an intensive sweetener or mixtures of intensive sweeteners.

The gum in the present invention has pure white color and has a kilocalorie value below 1 kilocalorie per piece and has excellent teeth cleaning properties.

20

The gum in the present invention includes a powder-mixing step after the pulling process and before the extrusion process or directly after the aeration process and before the extrusion if manufactured after the procedure mentioned in WO 98/34497.

25 The powder mixing is a process where the carbonate and the bicarbonate are added in a co-rotating twin screw. The powder is dosed with a screw dosage unit directly into the continuous added and mixed chewing gum mass. The powder of the

carbonate and the bicarbonate and maybe the intensive sweetener is added and distributed homogeneously into the chewing gum mass before leaving the twin screw mixing device.

5           The present invention includes a combination of carbonates and bicarbonates together with intensive sweeteners. Although not necessary, intensive sweeteners are added for better flavor performance.

10           The present invention is showing a surprisingly low salty taste because of the presence of bicarbonate in the mixture when prepared after the present invention.

The gum according to this invention may include a dry powder mixture of sodium or potassium carbonate and sodium or potassium bicarbonate with or without an intensive sweetener or mixtures hereof.

15

20           The present invention can also include a capsule containing the carbonate and the bicarbonate that is prepared with traditional encapsulation techniques like fluid bed, spray cooling, coasavation, or flash melt spinning techniques. The capsules can later be coated with wax or fat to prolong the release of the actives. The advantage of this is that flavor perception of the product can be improved significantly.

25           The mixture of carbonates and bicarbonates used in the present invention causes fast demineralisation of the saliva and also causes to raise the pH to above 7,5 to prevent the formation of plaque. The carbonic acid is known to be a good calcium remover, and this is important as calcium in the food later forms plaque on the teeth.

Various products containing carbonate and bicarbonate mixtures are known from the literature and the following references should be mentioned.

EP 414 932A1 discloses a chewing gum composition which comprises 25 to 5 90% gum base by weight of a known gum base, from 0,01% to 0,2% by weight of sodium fluoro phosphate, from 0,5% to 40% by weight of calcium carbonate of a particle size of 1 to 80µm, from 0,2 to 40% of a artificial sweetener, preferably sodium cyclamate, sodium saccharine, xylitol, sorbitol, from 2 to 25% by weight of a softening agent, preferably glycerol, from 1 to 10% by weight of a perfume and/or 10 flavourant, preferably a natural flavourant. The chewing gum composition exerts its anticariogenic effect both locally and internally, simultaneously assures a preferable condition for fluoride ions to build into the teeth by mechanical and chemical effect, thus less fluoride compound is needed and the building-in of fluorine ions is accelerated.

15

WO 97/22264 A1 discloses a chewing gum product that has a content of one or more therapeutic ingredients for improved dental health. In one embodiment a chewing gum product is described that includes a gum base, dispersed particles of organic encapsulated sodium bicarbonate, and a bulk sweetener. The sodium 20 bicarbonate ingredient is a novel composition of particles having a co-encapsulated content of a flavouring ingredient.

WO 97/12523 A1 discloses a chewing gum product, which has a content of one or more active ingredients for improved dental health. In one embodiment a 25 chewing gum product has a content of ingredients, which includes a gum base, dispersed particles of organic encapsulated sodium bicarbonate, a bulk sweetener, and a flavour.

US 4,357,354 describes a reduced calorie chewing gum which does not decrease in viscosity upon chewing and contains less the 65% of water soluble, such as sugar and/or sugar alcohol's as sweeteners, and includes gum base containing high  
5 level of inert fillers, such as calcium carbonate or talc in a amount of at least 40% by weight, softeners, such as lecithin, and optional synthetic non-caloric sweeteners, such as aspartame, saccharin, or cyclamates. The chewing gum includes at least about 10% air voids entrapped in the gum base matrix which, upon chewing becomes filled with moisture causing dramatic increase in cud size.

10

US patent 4.698.223 discloses a chewing gum composition, which comprises up to 99% by weight of a completely sugar-free base gum. Such a chewing gum is calorie-free and non-cariogenic. Furthermore it has been found to be substantially non-adhesive to the teeth, particularly to dental prostheses. The gum contains up to  
15 3% flavourings and up to 4% glycerol.

#### **Detailed description of the invention**

20 The present invention relates to an aerated sugarless gum product with improved oral properties, low calorie, low-density and with a gum base content above 90%. The product is aerated to improve flexibility and softness. The preferred density of the product is between 0,50 gram/millilitre to 0,90 gram/millilitre.

25 The product in the present invention has a pure white color and the kilocalorie value is below 1 kilocalorie per piece and shows excellent teeth cleaning properties.

A mixture of carbonates and bicarbonates is added to improve oral hygiene by neutralising the acid created from bacterial degradation of remaining food particles in mouth after intake of foods. Besides, by keeping the pH above 5.5 the risk of carries is reduced significantly.

5

The gum of the present invention contains a gum base, additives such as carbonates and bicarbonates or mixtures hereof, flavorings, other additives like intensive sweeteners and plasticisers.

10

Furthermore, the invention relates to the use of a gum base containing a mixture of the selected components. The gum will have a gum base content of at least 90%.

15

The gum of the present invention contains at least one carbonate and one bicarbonate selected from the following materials, potassium carbonate, potassium hydrogen carbonate, sodium carbonate, sodium hydrogen carbonate or mixtures hereof.

20

The gum of the present invention contains at least one intensive sweetener selected from aspartame, acesulfame K, neohesperidine, alitame, sukralose, sodium saccharin, cyclamate or mixtures hereof.

The gum of the present invention can be added up to 5% of aquarius plasticizer to improve the process properties of the gum and to improve flexibility of the finished gum.

25

Furthermore the present invention relates to a gum composed from the following selected components:

The preferred elastomers for the gum base composition of the invention are  
5 selected from a group containing among styrene butadiene copolymer (SBR rubber), polyisobutylene rubber with a molecular weight between 40.000 Flory to 1.400.000 Flory, isoprene isobutylene rubber (butyl rubber), polyvinyl acetate with a molecular weight of minimum 2000, polyvinyl acetate, vinyl laureate copolymer, polyvinyl alcohol, or hevea brasiliensis or mixtures hereof.

10

The preferred resins for the gum base composition of the invention is selected from a group containing glycerol ester of gum rosin, glycerol ester of wood rosin, glycerol ester of tall oil rosin, glycerol ester of gum rosin, glycerol ester of dimerized gum rosin, glycerol ester of dimerized wood rosin, glycerol ester of dimerized tall oil  
15 rosin, glycerol ester of polymerised gum rosin, glycerol ester of polymerised wood rosin, glycerol ester of polymerised tall oil rosin, glycerol ester of partially hydrogenated gum rosin, glycerol ester of partially hydrogenated wood rosin, penta eutritol ester of hydrogenated gum or wood rosin, methyl ester of partially hydrogenated gum or wood rosin, polymerised terpene resins based on monomers  
20 alpha pinene, beta pinene, and deltalimonene (dipentene) or mixtures hereof where the final polymer has a ring and ball softening point between 60 to 130 °C.

The preferred natural gums for the gum base composition of the invention is selected among sorva, sorvinha, chicle, jelutong, niger gutta, gutta hang kang, and  
25 masaeranduba balata or mixtures thereof.

The preferred fillers for the gum base composition of the invention is selected from a group containing calcium carbonate, calcium phosphate, di-calcium phosphate, tri- calcium phosphate, kaolin, talc, aluminium oxide and silicium oxide.

5        The preferred plasticisers for the gum base composition of the invention is selected from a group containing mono di-glyceride from edible fat or oil, distilled monoglyceride from edible fat or oil, acetylated monoglyceride, micro crystalline wax, paraffin wax, bee wax, candelilla wax, petroleum wax, lanolin, triacetin, partially or fully hydrogenated vegetable oil from soybean, coconut, palm, rape seed,  
10    peanut, shea nut, corn, cotton seed, or sunflower oil or mixtures hereof.

If required, the gum base may also contain different auxiliary ingredients preferably being selected among the antioxidants, such as butyl hydroxyanisole, butyl hydroxytoluene, propyl gallate, or tocopherols, inorganic or organic colorants, and  
15    sodium stearate, potassium stearate and sodium sulfide.

The invention is described further below by means of the following examples.

**Examples:**

		Example 1	Example 2	Example 3
20	Gum base	97,8%	96,7%	95,7%
	Potassium carbonate	00,2%		01,0%
	Potassium bicarbonate	00,3%		00,5%
	Sodium carbonate		00,5%	
	Sodium bicarbonate		01,0%	
25	Flavor	01,0%	01,2%	02,0%
	Spice extract	00,5%		00,5%
	Aspartame	00,1%		00,2%

	Acesulfame K			00,1%
	Sodium saccharin	00,1	00,2%	
	Cyclamate		00,1%	
	Plasticizer		00,3%	
5	Total	100,0%	100,0%	100,0%
		Example 4	Example 5	Example 6
	Gum base	93,7%	93,7%	93,7%
10	Potassium carbonate	01,6%	01,6%	00,8%
	Potassium bicarbonate	03,0%		01,5%
	Sodium carbonate			00,8%
	Sodium bicarbonate		03,0%	01,5%
	Flavor	01,4%	01,4%	01,4%
15	Spice extract			
	Aspartame			
	Acesulfame K			
	Sodium saccharin	00,2%	00,2%	00,2%
	Cyclamate	00,1%	00,1%	00,1%
20	Plasticizer			
	Total	100,0%	100,0%	100,0%

		Example 7	Example 8	Example 9
	Gum base			
	Gum base	93,7%	93,7%	93,7%
	Potassium carbonate			00,8%
5	Potassium bicarbonate	03,0%		01,5%
	Sodium carbonate	01,6%	01,6%	00,8%
	Sodium bicarbonate		03,0%	01,5%
	Flavor	01,4%	01,4%	01,4%
	Spice extract			
10	Aspartame			
	Acesulfame K			
	Sodium saccharin	00,2%	00,2%	00,2%
	Cyclamate	00,1%	00,1%	00,1%
	Plasticizer			
15	Total	100,0%	100,0%	100,0%

		Example 10	Example 11	Example 12
	Gum base	93,7%	93,7%	93,7%
	Encap. K <sub>2</sub> CO <sub>3</sub> 20% actives	01,6%	01,6%	00,8%
5	Encap. KHCO <sub>3</sub> 20% actives	03,0%		01,5%
	Encap Na <sub>2</sub> CO <sub>3</sub> 20% actives			00,8%
	Encap NaHCO <sub>3</sub> 20% actives		03,0%	01,5%
	Flavor	01,4%	01,4%	01,4%
	Spice extract			
10	Aspartame			
	Acesulfame K			
	Sodium saccharin	00,2%	00,2%	00,2%
	Cyclamate	00,1%	00,1%	00,1%
	Plasticizer			
15	Total	100,0%	100,0%	100,0%

		Example 13	Example 14	Example 15
	Gum base	93,7%	93,7%	93,7%
5	Encap. K <sub>2</sub> CO <sub>3</sub> 20% actives	01,6%	01,6%	00,8%
	Encap. KHCO <sub>3</sub> 20% actives	03,0%		01,5%
	Encap Na <sub>2</sub> CO <sub>3</sub> 20% actives			00,8%
	Encap NaHCO <sub>3</sub> 20% actives		03,0%	01,5%
	Flavor	01,4%	01,4%	01,4%
10	Spice extract			
	Aspartame	00,2%		00,1%
	Acesulfame K	00,1%	00,2%	00,1%
	Sodium saccharin		00,1%	
	Cyclamate			00,1%
15	Plasticizer			
	Total	100,0%	100,0%	100,0%

		Example 16	Example 17	Example 18
	Gum base	92,2%	92,5%	92,5%
	Encap. K <sub>2</sub> CO <sub>3</sub> 20% actives	01,6%	01,6%	00,8%
5	Encap. KHCO <sub>3</sub> 20% actives	03,0%		01,5%
	Encap Na <sub>2</sub> CO <sub>3</sub> 20% actives			00,8%
	Encap NaHCO <sub>3</sub> 20% actives		03,0%	01,5%
	Flavor	01,4%	01,4%	01,4%
	Spice extract	00,3%		
10	Encap. Aspartame 20% actives	01,0%		00,5%
	Encap.acesulfame K 20% actives	00,5%	01,0%	00,5%
	Encap Na saccharin 20% actives		00,5%	
	Encap. Cyclamate 20% actives			00,5%
	Plasticizer			
15	Total	100,0%	100,0%	100,0%

		Example 19	Example 20	Example 21
	Gum base	91,5%	92,0%	90,5%
5	Potassium carbonate	01,6%	01,6%	00,8%
	Potassium bicarbonate	03,0%		01,5%
	Sodium carbonate			00,8%
	Sodium bicarbonate		03,0%	01,5%
	Flavor	01,4%	01,4%	01,4%
10	Spice extract		00,3%	
	Encap. Aspartame 20% actives	01,0%		00,5%
	Encap. acesulfame K 20% actives	00,5%	01,0%	00,5%
	Encap. Na saccharin 20% actives		00,5%	
	Encap. Cyclamate 20% actives			00,5%
15	Plasticizer	01,0%	00,2%	02,0%
	Total	100,0%	100,0%	100,0%

	Example 22	Example 23	Example 24
Gum base	91,5%	92,3%	91,3%
Encap. K <sub>2</sub> CO <sub>3</sub> 20% actives	01,6%	01,6%	00,8%
5 Encap. KHCO <sub>3</sub> 20% actives	03,0%		01,5%
Encap Na <sub>2</sub> CO <sub>3</sub> 20% actives			00,8%
Encap NaHCO <sub>3</sub> 20% actives		03,0%	01,5%
Flavor	01,4%	01,4%	01,4%
Spice extract			
10 Encap. Aspartame 20% actives	01,0%		00,5%
Encap.acesulfame K 20% actives	00,5%	01,0%	00,5%
Encap Na saccharin 20% actives		00,5%	
Encap. Cyclamate 20% actives			00,5%
Plasticizer	01,0%	00,2%	01,2%
15 Total	100,0%	100,0%	100,0%

A test was conducted to measure saliva after chewing the gum by 8 persons and test results are shown on the attached Chart. Saliva was collected after 0, 3, 5, 10, 20, and 30 minutes and pH of saliva was measured.

## CLAIMS

1. A chewing gum having a gum base content as 90 to 99% by weight, with a density between 0,5 gram/millilitre to 0,9 gram/millilitre containing at least one of a carbonate and a bicarbonate salt.  
5
2. Chewing gum as claimed in claim 1 wherein the additives such as a plasticiser, an intensive sweetener or a mixture of sweeteners can be added.
- 10 3. Chewing gum as claimed in Claim 1 and 2 wherein the gum includes 0,1% to 2,0% by weight of carbonate.
4. Chewing gum as claimed in Claim 1 to 3 wherein the gum includes 0,1% to 3,0% by weight of bicarbonate.  
15
5. Chewing gum as claimed in claim 1 to 4 wherein the ratio of carbonate and bicarbonate is 10:1 to 1:10.
6. Chewing gum as claimed in claim 1 to 5 wherein the chewing gum includes 0,2% to 2,5% by weight of flavor.  
20
7. Chewing gum as claimed in claim 2 wherein the chewing gum includes 0,1% to 1,5% by weight of intensive sweetener.
- 25 8. Chewing gum as claimed in claim 2 wherein the chewing gum includes 0,1% to 5% by weight of plasticiser.

9. Chewing gum as claimed in claim 1 wherein gum base contains an elastomer selected from a group containing styrene butadiene copolymer (SBR rubber), polyisobutylene rubber with a molecular weight between 40.000 Flory to 1.400.000 Flory, isoprene isobutylene rubber (butyl rubber), polyvinyl acetate with a molecular weight of minimum 2000 or polyvinyl acetate, vinyl laureate copolymer, polyvinyl alcohol, or hevea brasiliensis or mixtures hereof.
10. Chewing gum as claimed in claim 1 wherein gum base contains a natural elastomer or nature gum selected from a group containing sorva, sorvinha, chicle, jelutong, niger gutta, gutta hang kang, and masaeranduba balata or mixtures thereof.
11. Chewing gum as claimed in claim 1 wherein gum base contains a resinous elastomer solvent selected from a group containing glycerol ester of gum rosin, glycerol ester of wood rosin, glycerol ester of tall oil rosin, glycerol ester of gum rosin, glycerol ester of dimerized gum rosin, glycerol ester of dimerized wood rosin, glycerol ester of dimerized tall oil rosin, glycerol ester of polymerized gum rosin, glycerol ester of polymerized wood rosin, glycerol ester of polymerized tall oil rosin, glycerol ester of partially hydrogenated gum rosin, glycerol ester of partially hydrogenated wood rosin, pentaeritritol ester of hydrogenated gum or wood rosin, methyl ester of partially hydrogenated gum rosin, methyl ester of partially hydrogenated wood rosin, polymerised terpene resins based on monomers alpha pinene, beta pinene, and daltalimonene (dipentene) or mixtures hereof where the final polymer has a ring and ball softening point between 60 to 130 ° C.

12. Chewing gum as claimed in claim 1 wherein gum base contains a filler selected from a group containing calcium carbonate, calcium phosphate, di-calcium phosphate, tri-calcium phosphate, kaolin, talc, aluminium oxide, and silicium oxide or mixtures thereof.
- 5
13. Chewing gum as claimed in claim 1 and 8 wherein gum base contains a plasticiser selected from a group containing mono diglyceride of edible fats and oils, distilled monoglyceride of edible fats or oils, acetylated monoglyceride of edible fats or oils, microcrystalline wax, paraffin wax, bee wax, candelilla wax, petroleum wax, lanolin, triacetin, partially or fully hydrogenated vegetable oil of soybean, coconut, palm, rape seed, peanut, sheanut, corn, cotton seed, or sunflower oil or mixtures thereof.
- 10
14. Chewing gum as claimed in claim 1 wherein gum base contains auxiliary ingredients such as antioxidants, selected from butyl hydroxyanisole, butyl hydroxytoluene, propyl gallate, or tocopherols, inorganic or organic colorants, additives like sodium stearate, potassium stearate and sodium sulphide.
- 15
15. Chewing gum as claimed in claim 3 wherein carbonate is potassium carbonate or sodium carbonate.
- 20
16. Chewing gum as claimed in claim 4 wherein bicarbonate is potassium bicarbonate or sodium bicarbonate.
- 25
17. Chewing gum as claimed in claim 6 wherein flavor is selected from a group containing liquid spice extracts flavors and oils spray dried spice extracts flavors or oils, encapsulated spice extracts flavors or oils, or mixtures thereof.

18. Chewing gum as claimed in claim 7 wherein the intensive sweetener is selected from a group containing aspartame, acetsulfame K, neohesperidine, alitame, sukralose, sodium saccharin, cyclamate or mixtures thereof.
- 5 19. Chewing gum as claimed in claim 8 wherein the selected plasticiser is water.
20. Chewing gum as claimed in claim 3 and 15 wherein the carbonate is added as dry powder or encapsulated with a carrier.
- 10 21. Chewing gum as claimed in claim 4 and 16 wherein the bicarbonate is added as dry powder or encapsulated with a carrier.
22. Chewing gum as claimed in claim 7 and 18 wherein the intensive sweetener is added as a dry powder or encapsulated with a carrier
- 15 23. Chewing gum as claimed in claim 1 to 22 wherein the carbonate, bicarbonate and the intensive sweetener can be encapsulated together.
24. Chewing gum as claimed in claim 23 wherein the encapsulation is made by means of a fluid bed, spray cooling, coasavation, or flash melt spinning and then coated with vegetable oil or wax.
- 20 25. A method to manufacture a chewing gum wherein the gum base is mixed with the flavor and plasticiser in a Z blade mixer heated with steam or oil to a temperature between 120 to 150°C until a homogenous mixture is achieved.
- 25

26. Method as claimed in claim 25 wherein the gum and flavor mixture is cooled in water and pulled in a pulling machine and later the gum is mixed in a powder mixer with intensive sweeteners and carbonate and bicarbonate mixture, following that step gum is extruded and cooled in a cooling tunnel and packed on a cut and wrap machine.
27. Method as claimed in claim 25 and 26 also containing the following steps
- a) the gum base being in a molten stage at a temperature between 80 to 120°C is pumped to a holding tank and from there cooled in a heat exchanger;
  - b) gum is cooled to a temperature between 45°C to 65°;
  - c) after cooling, flavors and plasticizers are injected into the mixture and mixed with air under pressure in an aerating device;
  - d) after aeration gum is mixed in a powder mixer with the carbonate, bicarbonate and intensive sweetener;
  - e) after the powder mixing the gum is extruded and the gum rope is cooled in a cooling tunnel and packed in a cut and wrap machine.

**AMENDED CLAIMS**

[received by the International Bureau on 10 August 2001 (10.08.01);  
original claims 1-27 replaced by new claims 1-23 (3 pages)]

1. A non-bulk-sweetened chewing gum product, comprising:  
gum base comprising between 90 percent and 99 percent by weight of the gum  
5 product; and  
an effective amount of a plaque-inhibiting ingredient comprising at least one of a  
carbonate salt and a bicarbonate salt.
2. The non-bulk-sweetened gum product of claim 1, further comprising an  
intensive sweetener.
- 10 3. The non-bulk-sweetened gum product of claim 2, wherein the intensive  
sweetener is selected from the group consisting of aspartame, acetsulfame K,  
neohesperidine, alitame, sukralose, sodium saccharin, cyclamate, and mixtures thereof.
4. The non-bulk-sweetened gum product of claim 1, wherein the plaque-  
inhibiting ingredient comprises a carbonate salt present in an amount of 0.1 percent to 2  
15 percent by weight of the gum product.
5. The non-bulk-sweetened gum product of claim 1, wherein the plaque-  
inhibiting ingredient comprises a bicarbonate salt present in an amount of 0.1 percent to 3  
percent by weight of the gum product.
6. The non-bulk-sweetened gum product of claim 1, wherein the plaque-  
20 inhibiting ingredient comprises both a carbonate salt and a bicarbonate salt.
7. The non-bulk-sweetened gum product of claim 6, wherein the weight ratio of  
the carbonate salt to the bicarbonate salt is between 10:1 and 1:10.
8. The non-bulk-sweetened gum product of claim 1, further comprising a flavor  
present in an amount of 0.2 percent to 2.5 percent by weight of the gum product.

9. The non-bulk-sweetened gum product of claim 2, wherein the intensive sweetener is present in an amount of 0.01 percent to 1.5 percent by weight of the gum product.

10. The non-bulk-sweetened gum product of claim 1, further comprising a plasticiser present in an amount of 0.1 percent to 5 percent by weight of the gum product.

11. The non-bulk-sweetened gum product of claim 1, wherein the gum base comprises an elastomer selected from the group consisting of styrene butadiene copolymer, polyisobutylene rubber with a molecular weight between 40.000 Flory and 1.400.000 Flory, isoprene isobutylene rubber, polyvinyl acetate with a molecular weight of at least 2000, polyvinyl acetate, vinyl laureate copolymer, polyvinyl alcohol, hevea brasiliensis, and mixtures thereof.

12. The non-bulk-sweetened gum product of claim 1, wherein the gum base contains a natural elastomer selected from the group consisting of sorva, sorvinha, chicle, jelutong, niger gutta, gutta hang kang, masaeranduba balata, and mixtures thereof.

13. The non-bulk-sweetened gum product of claim 1, wherein the gum base contains a resinous elastomer solvent selected from the group consisting of glycerol ester of gum rosin, glycerol ester of wood rosin, glycerol ester of tall oil rosin, glycerol ester of dimerized gum rosin, glycerol ester of dimerized wood rosin, glycerol ester of dimerized tall oil rosin, glycerol ester of polymerized gum rosin, glycerol ester of polymerized wood rosin, glycerol ester of polymerized tall oil rosin, glycerol ester of partially hydrogenated gum rosin, glycerol ester of partially hydrogenated wood rosin, pentaeutritol ester of hydrogenated gum or wood rosin, methyl ester of partially hydrogenated wood rosin, and polymerized terpene resins based on monomers alpha pinene, beta pinene, and deltalimonene (dipentene), and mixtures thereof where the final polymer has a ring and ball softening point between 60°C and 130°C.

14. The non-bulk-sweetened gum product of claim 1, wherein the gum base includes a filler.

15. The non-bulk-sweetened gum product of claim 1, further comprising an antioxidant.

16. The non-bulk-sweetened gum product of claim 4, wherein the carbonate salt comprises at least one of potassium carbonate and sodium carbonate.

5 17. The non-bulk-sweetened gum product of claim 5, wherein the bicarbonate salt comprises at least one of potassium bicarbonate and sodium bicarbonate.

18. The non-bulk-sweetened gum product of claim 8, wherein the flavor is selected from the group consisting of liquid spice extracts, flavors, and oils; spray-dried spice extract, flavors, and oils; encapsulated spice extracts, flavors, and oils; and mixtures  
10 thereof.

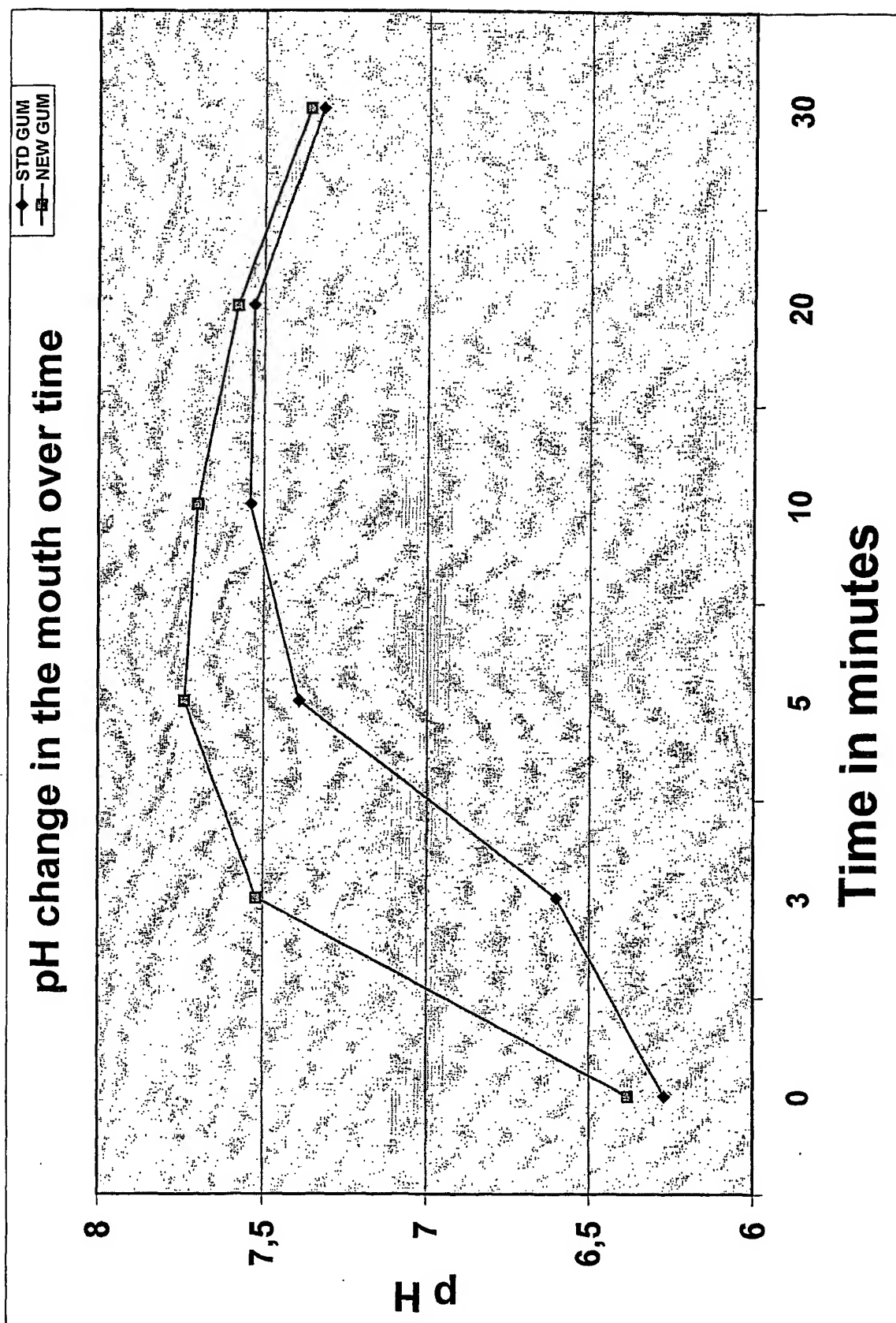
19. The non-bulk-sweetened gum product of claim 1, wherein the plaque-inhibiting ingredient is added as a dry powder.

20. The non-bulk-sweetened gum product of claim 1, wherein the plaque-inhibiting ingredient is encapsulated with a carrier.

15 21. The non-bulk-sweetened gum product of claim 2, wherein the plaque-inhibiting ingredient and the intensive sweetener are encapsulated together.

22. The non-bulk-sweetened gum product of claim 21, wherein the plaque-inhibiting ingredient and the intensive sweetener are encapsulated together by one of a fluid bed, spray cooling, coasavation, and flash melt spinning process, and then coated  
20 with vegetable oil or wax.

23. The non-bulk-sweetened gum product of claim 1, wherein the gum product has a density between 0.5 and 0.9 grams per millilitre.



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/TR 00/00019

## CLASSIFICATION OF SUBJECT MATTER

IPC<sup>7</sup>: A23G 3/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC<sup>7</sup>: A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98/34497 A1 (DANDY SAKIZ VE SEKERLEME SANAYI AS) 13 August 1998 (13.08.98) the whole document.	1-27
A	US 5139797 A (HUZINEC R. et al.) 18 August 1992 (18.08.92) the whole document.	1-27
A	US 5154939 A (BRODERICK et al.) 13 October 1992 (13.10.92) the whole document.	1-27

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

„A“ document defining the general state of the art which is not considered to be of particular relevance

„E“ earlier application or patent but published on or after the international filing date

„L“ document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

„O“ document referring to an oral disclosure, use, exhibition or other means

„P“ document published prior to the international filing date but later than the priority date claimed

„T“ later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

„X“ document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

„Y“ document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

„&amp;“ document member of the same patent family

Date of the actual completion of the international search

16 January 2001 (16.01.2001)

Date of mailing of the international search report

2 April 2001 (02.04.2001)

Name and mailing address of the ISA/AT

Austrian Patent Office

Kohlmarkt 8-10; A-1014 Vienna

Facsimile No. 1/53424/535

Authorized officer

KRENN

Telephone No. 1/53424/435

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
PCT/TR 00/00019

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	A	5139797	18-08-1992		none	
US	A	5154939	13-10-1992	AT	E	95983
				AT	E	140856
				AU	A1	50214/90
				AU	A1	55269/90
				AU	B2	619152
				AU	B2	624243
				CA	AA	2014275
				CA	A1	1335763
				CA	C	2014275
				CN	A	1046445
				CN	A	1054884
				DE	C0	69004047
				DE	T2	69004047
				DE	C0	69027969
				DE	T2	69027969
				DK	T3	423255
				DK	T3	422189
				EP	A1	422189
				EP	A1	423255
				EP	A4	422189
				EP	A4	423255
				EP	B1	423255
				EP	B1	422189
				ES	T3	2045906
				FI	A0	906250
				FI	A0	906251
				JP	T2	3505282
				JP	B4	7051049
				NZ	A	232236
				NZ	A	233310
				PH	A	26002
				US	A	4978537
				WO	A1	9012511
				WO	A1	9012512
				US	A	5108762
				US	A	5139794
				US	A	5165944
				US	A	5169658
				US	A	5198251
				US	A	5229148
				AU	A1	86846/91
				AU	B2	637029
				CA	AA	2053958
				CN	A	1062073
				EP	A1	484124
				FI	A0	915096
				FI	A	915096
				JP	A2	4262748
				NO	A0	914242
				NO	A	914242
				AU	A1	271114/92
				AU	B2	644766
				CA	AA	2079423
				CA	C	2079423
				DE	C0	69215483
				DE	T2	69215483
				EP	A1	537919
				EP	B1	537919
				FI	A0	924706
				FI	A	924706
				JP	A2	5292890
				MX	A1	9205986
				AT	E	123650
				AU	A1	62639/90
				AU	B2	639645
				CA	AA	2025764
				CA	C	2025764
				CN	A	1054368
				DE	C0	69020088
				DE	T2	69020088
				DK	T3	422820
				EP	A2	422820
				EP	A3	422820
				EP	TD	422820
						15-11-1993
						15-08-1996
						16-11-1990
						16-11-1990
						16-01-1992
						04-06-1992
						19-10-1990
						06-06-1995
						15-04-1997
						31-10-1990
						02-10-1991
						25-11-1993
						10-02-1994
						05-09-1996
						06-02-1997
						13-12-1993
						26-08-1996
						17-04-1991
						24-04-1991
						05-06-1991
						02-10-1991
						20-10-1993
						31-07-1996
						16-01-1994
						18-12-1990
						18-12-1990
						21-11-1991
						05-06-1995
						25-10-1991
						26-05-1992
						29-01-1992
						18-12-1990
						01-11-1990
						01-11-1990
						28-04-1992
						18-08-1992
						24-11-1992
						08-12-1992
						30-03-1993
						20-07-1993
						16-01-1992
						13-05-1993
						01-05-1992
						24-06-1992
						06-05-1992
						29-10-1991
						01-05-1992
						18-09-1992
						29-10-1991
						04-05-1992
						17-12-1992
						16-12-1993
						19-04-1993
						18-11-1997
						09-01-1997
						03-04-1997
						21-04-1993
						27-11-1996
						16-10-1992
						19-04-1993
						09-11-1993
						29-07-1993
						15-06-1995
						26-04-1991
						29-07-1993
						11-04-1991
						03-09-1996
						11-09-1991
						20-07-1995
						01-02-1996
						14-08-1995
						17-04-1991
						11-09-1991
						28-11-1991

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

international application No.  
**PCT/TR 00/00019**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP B1 422820	14-06-1995
		ES T3 2073538	16-08-1995
		FI A0 904598	18-09-1990
		JP A2 3206110	09-09-1991
		NO A0 904370	09-10-1990
		NO A 904370	11-04-1991
		NZ A 235372	26-05-1992
		US A 5364627	15-11-1994
		WO A1 9107103	30-05-1991
		AT E 103773	15-04-1994
		AU A1 69039/91	13-06-1991
		AU B2 636428	29-04-1993
		FI A0 913209	02-07-1991
		DE C0 69007972	11-05-1994
		DE T2 69007972	08-09-1994
		EP A1 454833	06-11-1991
		EP A4 454833	29-04-1992
		EP B1 454833	06-04-1994
		AU A1 33366/93	19-07-1993
		AU B2 664729	30-11-1995
		EP A1 617579	05-10-1994
		EP A4 617579	09-08-1995
		WO A1 9311674	24-06-1993
		AU A1 48425/90	13-08-1990
		AU A1 68717/91	13-06-1991
		AU A1 68888/91	13-06-1991
		AU A1 69032/91	13-06-1991
		AU B2 634620	25-02-1993
		AU B2 635376	18-03-1993
		CA AA 2045577	23-05-1991
		CA AA 2045598	23-05-1991
		CA C 2045607	22-07-1997
		EP A1 454829	06-11-1991
		EP A1 454832	06-11-1991
		EP A4 454832	06-05-1992
		EP A4 454829	03-06-1992
		EP B1 454829	13-07-1994
		EP B1 454832	28-09-1994
		ES T3 2052361	01-07-1994
		ES T3 2056492	01-10-1994
		ES T3 2062753	16-12-1994
		FI A0 913208	02-07-1991
		FI A0 913210	02-07-1991
		WO A2 9007859	26-07-1990
		WO A3 9007859	04-10-1990
		WO A1 9107102	30-05-1991
		WO A1 9107104	30-05-1991
		WO A1 9107784	30-05-1991
		AT E 108305	15-07-1994
		AT E 112139	15-10-1994
		CA C 2045577	07-01-1997
		CA C 2045598	22-07-1997
		DE C0 69010668	18-08-1994
		DE C0 69012985	03-11-1994
		DE T2 69010668	12-01-1995
		DE T2 69012985	04-05-1995
		DK T3 454833	02-05-1994
		DK T3 454829	15-08-1994
		DK T3 454832	24-10-1994
		IL A0 96349	25-05-1992
		US A 5159347	27-10-1992
		US A 5139798	18-08-1992
WO A1 9834497	13-08-1998	AU A1 57761/98	26-08-1998
		CN T 1251019	19-04-2000
		TR A2 9700104	21-08-1998
		TR T2 9901900	22-11-1999